

The impact of owning a guide dog on the quality of life of individuals with a visual impairment: a longitudinal study.

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Conflict of interest statement

In accordance with Taylor & Francis policy and my ethical obligation as a researcher, I am reporting that I, Sara McIver am an employee of Guide Dogs UK, a company that may be affected by the research reported in the enclosed paper. I have disclosed those interests fully to Taylor & Francis, and I have in place an approved plan for managing any potential conflicts arising from this employment.

Word count - 4306

Abstract

Quality of life (QOL) is generally understood to be an individual's subjective view of how they feel about different aspects and experiences in their life. Previous studies have reported many positive benefits of owning assistance dogs on their owners' lives, but these have been largely cross-sectional studies and QOL has not been considered in guide dog owners. A longitudinal cohort study was undertaken using the Flanagan quality of life questionnaire to compare individuals on the UK guide dog national waiting list and established guide dog owners at two time points. Data collected from both time points were compared between three groups: those who remained on the waiting list throughout the study ($n = 17$), those who acquired a guide dog during the study ($n = 15$) and established guide dog owners ($n = 14$). Analysis comparing the effect of 'group' was conducted on individual questionnaire items as well as total quality of life score. Individuals who acquired a guide dog during the study showed a significant increase in perceptions of independence in comparison to those who remained on the waiting list. In general, those in the established guide dog group and those who acquired a guide dog demonstrated increased perceived QOL over time, but those who remained on the waiting list showed a decrease. Effect size was highest on items relating to health, material comforts, independence and total QOL. Comparison with previous research looking at QOL with hearing dog and physical assistance dog partners showed that guide dog ownership may be specifically associated with perceived gains in terms of material comforts and inter-personal relationships.

Keywords: quality of life; assistance dogs; guide dog

Introduction

The World Health Organisation (1998) defines quality of life (QOL) as an individual's experienced standard of health, comfort and happiness. It is a broad concept that can be defined in many ways (Fallowfield, 2009), but is generally understood to be an individual's subjective view of how they feel about different aspects and experiences of their life (Theofilau, 2013).

Instruments to measure quality of life are as broad and wide ranging as the definitions of this concept (e.g. see Berzon, Donnelly, Simpson, Simeon, & Tilson, 1995). Many instruments are specific to physical health and/or symptoms, such as the World Health Organisation quality of life questionnaire (WHOQOL) and Medical Outcomes Study 36 Item questionnaire (SF-36V2). It has been argued that these assessments ignore broader aspects of an individual's life which are important, including leisure, relationships and personal development (Albrecht & Devlieger, 1999; Burckhardt, Anderson, Archenholtz, & Hägg, 2003; Carr & Higginson, 2001). Indeed, different disabilities affect people in a variety of ways, impacting upon their work, social life and levels of independence, as well as their physical health, all of which contribute to a person's experience of quality of life (Viemerö & Krause, 1998; Levasseur, Tribble & Desrosiers, 2006). It is therefore important that we evaluate the effectiveness of interventions which improve an individual's ability to adjust and cope in a global sense to their specific needs (Viemerö et al, 1998), with recognition that this wider impact goes beyond those relating directly to the disability (Stringaris & Goodman, 2013).

Interest in animal-assisted interventions (AAI) is growing rapidly, both in terms of scientific interest (e.g. Maujean, Pepping & Kendall, 2015; Mills & Hall, 2014; Lundqvist, Carlsson, Sjö Dahl, Theodorsson & Levin, 2017) as well as service demand and availability (Walther et al. 2017). AAI can take many guises, but here we focus on the use of dogs to support and assist individuals with specific physical needs. These dogs, often referred to as assistance dogs, have been trained to help individuals with visual (guide dog), hearing (hearing dogs) and physical disabilities (physical assistance dogs) to accomplish numerous daily tasks such as, retrieving items, operating light switches, removing clothes, and alerting to dangers.

The benefits of living with these dogs are thought to be realised across a number of domains. On a physical level, assistance dogs can reduce an individual's levels of pain (Vincent, Gagnon, Dumont & ADMI, 2017), and increase efficiency of functioning due to reduced effort and time required for a task (Crowe et al. 2014; Lloyd, Budge, Grow & Stafford. 2000). On a psychological level, assistance dogs have been shown to increase their owner's confidence, self-esteem (Fairman & Huebner, 2000; Rintala, Matamoros & Seitz 2008; Shintani et al. 2010; Camp, 2001) and sense of independence (Lane, McNicholas & Collins 1998). In turn, this has been associated with benefits in an economic sense, reducing reliance on costly healthcare and support systems (Fairman & Huebner, 2000; Allen & Blascovich, 1996). On a social level, owning an assistance dog has been associated with improved social integration (Eddy & Hart, 1988; Hall, MacMichael, Turner & Mills, 2017; Mader, Hart & Bergin, 1989), with the public generally recognising the important work that these dogs do (Schoenfeld-Tacher, Hellyer, Cheung & Kogan, 2017). However, for some individuals with more invisible disabilities the presence of an assistance dog can bring unwanted attention to their disability (Mills, 2017). Additionally, it should be noted that although many studies have found positive relationships between having an

assistance dog and social, functional and psychological outcomes, one review of the literature has noted that the scientific quality of these studies is often low, being based on qualitative data, with poor methodological descriptions, small sample sizes and a lack of reporting of reliability or validity (Winkle, Crowe & Hendrix, 2012).

It appears that only recently has there been more robust scientific reports of the value of the impact of assistance dogs on owner's general quality of life, as assessed through a validated quality of life scale. In a cross-sectional study, Hall et al (2017) used the Flanagan quality of life scale to assess the impact of physical assistance service dogs and hearing dogs on the quality of life of individuals with physical and hearing disabilities compared to a waiting list control group. Individuals scored higher on the total quality of life score if they owned an assistance dog compared to waiting list controls; although this was only statistically significant for those with a physical assistance dog. Both dog-owning groups scored higher in items related to health, learning and independence. However, as they were cross-sectional studies, quality of life scores were only considered at one time point with two unrelated groups of individuals, making it difficult to reliably isolate the role of having the assistance dog in this effect. Studies which have used a longitudinal, pre-post design report mixed effects. In a study of 11 wheelchair users, Hubert, Tousignant, Routhier, Corriveau & Champagne (2013) reported no significant changes in health-related quality of life (Quality of Life Index; Ferrans & Powers, 1985) in relation to physical assistance dog acquisition, although improvements were noted in terms of reduced shoulder pain and intensity of effort. In a larger sample of 55 assistance dog owners, Lundqvist, Levin, Roback & Alwin (2018) concluded that acquiring a physical assistance service or hearing dog may have a positive impact on health-related quality of life, well-being and activity level. Three months post dog acquisition participants reported statistically significant improvements on some assessments of quality of life, including on the

visual analogue scale version of the EQ-5D (Szende, 2007) and physical role functioning, emotional role functioning and health transition scores on the RAND-36 (Hays and Morales, 2001) but not on other items.

It is clear that more research is needed in this area and that the relationship between assistance dog ownership and quality of life may not be simple (White, Mills & Hall, 2017), given the diversity of contexts in which they are used. It is evident that assessment of quality of life, using a validated scale, has only been done for certain types of assistance dogs, with little attention paid to the impact of acquiring a guide dog for their owners, often with quite limited single-point sampling experimental designs. Therefore, the aim of this study was to assess the impact of acquiring a guide dog on an individuals' perceived quality of life, using a cohort study with a waiting list control.

Method

Ethics, Consent and Permissions

Study procedures complied with the British Psychological Society (BPS) Ethics Code of Conduct (Ethics Committee, 2009) and ethical approval was obtained from the designated authority of the College of Science Ethics Committee, University of Lincoln. Participants gave fully informed consent to participate in the study and for their data to be reported anonymously.

Participants

Participants were initially recruited from the database of clients held by Guide Dogs UK in August 2017 (Time 1: T1). Given that guide dogs might work with individuals with a range of disabilities, the only general stipulation set on participating in the study was that the individual was over 18 years and met the criteria for receiving a guide dog set by Guide Dogs UK (see Table 1). Guide Dogs UK clients were only contacted if they had previously agreed to receive contact from Guide Dogs UK about research and did not stipulate “post only” contact. All eligible clients were contacted via email or telephone, (depending upon their registered preferred method of contact), with details of the study.

Clients who were existing guide dog owners were contacted if they had a partnership established with their dog for a minimum of three years. Of the 100 clients with dogs who were contacted to take part, 21 (21.0%) enrolled in the study. Of the 176 clients contacted on the waiting list to receive a guide dog, 56 (31.8%) enrolled in the study.

At the second data collection point, 6-months after initial recruitment (Time 2: T2), those participants who had completed the survey were contacted again to re-take the survey. From the initial selection of participants 14 established guide dog owners completed the survey (66.7%). From the waiting list control 17 who remained on the waiting list, without a dog (30.3%) and 15 who had received a guide dog (26.7%) provided data. Only those individuals who completed the survey at both time points (T1 and T2) were included in the second data collection.

Design and Materials

The survey design consisted of two parts. The first part asked the client to state their age category (see Table 1), gender and current guide dog status.

The second part assessed quality of life, using a 16-item adaptation of the original 15 item Flanagan Quality of Life Scale (QOLS) which is suitable for use with participants living with chronic conditions (Flanagan, 1978; Flanagan, 1982) and has previously been used to assess quality of life across diverse groups including those with chronic illnesses and disabilities within the assistance dog population (Burckhardt et al. 2003; Hall et al. 2017). The additional 16th item assessed independence, which was considered important with our cohort, since assistance dogs are often applied for in the belief that they increase their owner's independence. Example items from the scale include "Participating in organisations and public affairs" and "Expressing yourself creatively". We used the seven-point scale, over the five-point scale, for scoring each of the 16 items (1 = Terrible, 4 = Mixed, 7 = Delighted), since this version is thought to be more sensitive (Andrews & Crandall, 1976). Although there is some debate as to whether the scale is best measured in terms of three factors or as a uni-factor (Burckhardt et al. 2003) we followed the data analysis protocol outlined in the original design of the scale and that was used by a similar study conducted by Hall et al. (2017). This considers scores on the individual scale items as well as a total quality of life (QOL) score calculated by summing the item scores.

Procedure

A secure online survey software was used to collect data. The survey was checked for compatibility with screen readers and mobile devices by Guide Dogs UK accessibility team to ensure individuals with any visual impairment could access it. If participants had registered a preference to receive telephone contact, a researcher (SM) called them to complete the survey over the phone (18.1% of total sample). Data was collected over

two time periods; the first baseline data collection occurred over five weeks commencing 1st August 2017 (T1) and the second data collection commenced at least 6 months later on 1st February 2018 for 5 weeks (T2). Reminders were sent after two weeks from the commencement of data collection via the participant's preferred method of contact. No more than one reminder was sent.

Data analysis

Data were analysed using IBM SPSS v22 (IBM Corp, 2013). The three groups were first compared for differences in their demographic characteristics using chi-squared tests or Fishers exact tests as appropriate. ANOVAs were then conducted to investigate the impact of assistance dog ownership on QOL. Change scores (T2 – T1) within each group (acquired a dog, established guide dog owners, remained on the waiting list) were used in the ANOVAs as these appeared normally distributed, and therefore more suitable for parametric testing. Given the negligible effect of age and gender between the groups, these factors were not controlled for which also served to increase statistical power in this small sample study (Field, 2013; Sullivan, Weinberg & Keaney, 2016; VanVoorhis & Morgan, 2007). Using a similar analysis strategy to that reported by Hall et al. (2017), we first conducted a univariate ANOVA on total QOL scores, before further exploring for potential differences on each item using a multivariate ANOVA.

Results

Age and gender

The three groups were similar in age-group and gender divisions. Chi square analyses, using Fishers exact test where necessary, revealed there was no significant difference between the three groups based on age category ($\chi^2 (8) = 3.97, p > 0.05$), or gender ($\chi^2 (2) = 1.07, p > 0.05$) (see Table 1).

Quality of life between groups

Descriptive statistics and effect sizes for the QOL analysis are reported in Table 2.

The univariate ANOVA revealed there were no statistically significant differences between the three groups in QOL change scores on total QOL ($F(2, 45) = 1.52, p = 0.23$). Subsequent multivariate ANOVA revealed a significant difference in change scores between the groups on the independence item ($F(2, 45) = 3.26, p = 0.04$ (see Table 2)). Post-hoc comparisons revealed that those who acquired a guide dog between T1 and T2 showed an increased in perceived independence in comparison to those who remained on the waiting list ($p = 0.04$). There were no significant results with established guide dog owners ($p > 0.05$). There were no statistically significant differences between the three groups in QOL change scores for any other item: material comforts ($F(2, 45) = 1.48, p = 0.24$), health ($F(2, 45) = 1.87, p = 0.16$), relationships ($F(2, 45) = 0.70, p = 0.50$), having children ($F(2, 45) = 0.31, p = 0.73$), relationship with spouse ($F(2, 45) = 0.28, p = 0.75$), friends ($F(2, 45) = 0.45, p = 0.64$), helping ($F(2, 45) = 1.17, p = 0.32$), participating in organisations ($F(2, 45) = 0.36, p = 0.69$), learning ($F(2, 45) = 1.46, p = 0.23$),

understanding self ($F(2, 45) = 0.98, p = 0.38$), working ($F(2, 45) = 0.02, p = 0.97$), expressing self ($F(2, 45) = 0.31, p = 0.74$), socialising ($F(2, 45) = 0.27, p = 0.75$), reading ($F(2, 45) = 0.23, p = 0.79$), and active recreation ($F(2, 45) = 0.76, p = 0.47$).

Effect sizes

Given the small sample size of the three groups we report effect sizes for the effect of ‘Group’ as well as pairwise comparisons to enable specific comparisons between the three groups (see Table 2). Additionally, to facilitate comparisons with previous cross-sectional research (Hall et al. 2017) we report effect sizes at T2 when comparing established guide dog owners with those who remained on the waiting list (see Table 3). The largest effect sizes (medium/approaching medium) were observed in relation to scores on: total QOL, material comforts, health and independence (see Table 2). Comparisons of means shows that, at T1, total QOL score was highest in the established guide dog owner group and remained similar over time, whereas total QOL score increased over time in the acquired a dog group and decreased slightly in the waiting list group, with this latter comparison reaching a medium effect size. Scores on the material comforts item were highest at T1 for the established guide dog owners and this score increased over time. In comparison, those who acquired a guide dog showed similar scores on this item over time, whereas those who remained on the waiting list showed a decrease; the largest effect size (approaching medium effect) was evident in the comparison between the waiting list group and the established guide dog owner group. Scores on the health item were highest at T1 for the established guide dog owners, but declined slightly over time. Scores on health also decreased over time for the waiting list group, but increased

slightly over time for the acquired a guide dog group, with this latter comparison reaching a medium effect size. The largest effect sizes were observed when comparing scores on independence. At T1 perceived independence was highest in the established guide dog group, which slightly increased over time. Scores on this item also increased for the acquired a guide dog group, but in contrast, decreased in the waiting list group, with this latter comparison showing the largest effect size.

Discussion

With the aim of assessing the impact that acquiring a guide dog may have on an individuals' perceived quality of life, we collected self-reported measures of quality of life from individuals on a national guide dog waiting list and established guide dog owners at baseline and 6-months later.

This is the first study known to the authors which explores the impact of acquiring a guide dog on owner quality of life using a longitudinal cohort design. In general, the findings support previous research which suggests that owning a trained assistance dog can bring positive effects to an individual's quality of life (Hall et al, 2017; Lundqvist et al. 2018; Shinanti et al, 2010). Although the sample sizes were small, we observed that those who acquired a guide dog showed a significant increase in perceptions of independence in comparison to those who remained on the waiting list. No other significant differences between the groups were identified. Effect size of group was highest on items relating to health, material comforts, independence and total QOL, with comparisons of means showing that in general, there was a trend for those in the

established guide dog group and those who acquired a guide dog to perceive increase QOL over time, supporting Lloyd, Budge, Stafford & La Grow (2009) who suggested that relationships between guide dogs and their new handler could take between 6-months to 1-year to develop. In comparison, those who remained on the waiting list showed a decrease. A larger study is required to determine the significance of these results. The implications of these effects are discussed in relation to comparisons of effect sizes with previous research (Hall et al. 2017).

Although the current study design is more robust than that conducted by Hall et al. (2017), the sample size is small and represents a limitation of the study when discussing statically significant differences. Nonetheless, effect size comparisons concerning the quality of life outcomes of established owners of guide dogs, hearing dogs and physical assistance dogs and those on waiting list controls can be made. These comparisons reveal that across the three groups (visual/guide, hearing and physical), acquiring a dog that has been trained to support their owner's specific needs has the biggest impact in terms of improving owners' perceptions of independence, in comparison to waiting list counterparts. This effect was largest for the physical assistance dog cohort, followed by the guide dog cohort and smallest for the hearing dog cohort, details are provided in Table 3. This result is congruent with previous research which suggests that assistance dogs can increase owner's confidence, self-esteem and general independence (Hall et al. 2017; Valentine, Kiddoo & LaFleur, 1993; Whitmarsh, 2005).

In general, effect sizes follow this trend, being larger for the guide dog cohort, particularly in relation to items of health, understanding self, expressing self and active recreation. It is possible that individuals requiring a physical assistance dog are more likely to have lower personal independence within their home environment (i.e. requiring assistance dressing and personal care), therefore potentially perceiving their quality of life to be lower compared to visually impaired or deaf individuals who may have greater personal independence. Comparisons of QOL scores

in the waiting list groups across the three cohorts supports this proposition (see Table 3). Indeed, Koch (2000) suggested that hearing impairment may result largely in a different kind of life quality, not necessarily lessened quality of life as the disability may be accepted and compensatory mechanisms such as different means of communication, like sign language and lip reading are used effectively. The same argument could be made for those with visual impairments, with the use of braille, long cane and assistive technology. However, those with physical disabilities may be much more limited in their interactions with society due to requirements for physical, personal or mechanical help. It is therefore possible that acquiring a trained dog brings maximal benefit to this group by helping owners gain independence and the capacity to partake in recreational activities.

There were a few items where effect size comparisons were notably larger for the guide dog group than the other cohorts, particularly in terms of scores on the material comforts item. Although on face value it may seem unusual for established guide dog owners to experience greater material comfort, included within in this item is ‘Material comforts, home, food, conveniences, financial security’. Previous research has highlighted that companion animals can bring considerable cost savings, due to reduced reliance on costly human healthcare services (Hall, Dolling, Bristow, Fuller & Mills, 2017). Therefore, in cases where the individual has personally contributed to their care and support provisions, building an established relationship with a trained guide dog may enable them to reduce reliance on these potentially costly services, facilitating an increase in disposable income for material comforts. This proposition could be further explored using qualitative interview methods, with themes compared and contrasted between assistance dog cohorts to help identify why acquiring a guide dog specifically may benefit owners in this respect. Further longitudinal cohort comparisons are required to establish the robustness of these observation.

Effect size comparisons were also larger for the guide dog cohort than the physical assistance service dog and hearing dog cohorts on items that relate to close inter-personal relationships, including ‘close relationships with spouse or significant other’, ‘relationships with parents, siblings & other relatives- communicating, visiting, helping’ and ‘close friends’. Research shows that both older and younger individuals with visual impairments are particularly at risk of social isolation (Coyle, Steinman & Chen, 2017; Jessup, Bundy, Broom & Hancock, 2018), yet supportive relations are crucial for successful adaption to vision loss (Guerette & Smedema, 2011; Reinhardt, 1996; 2001). Research suggests that dog ownership provides opportunities for social engagement with others (Wood, Giles-Corti & Bulsara, 2005; Wood et al, 2015) and that animals themselves provide a form of social support (McNicholas & Collis, 2006; Polheber & Matchock, 2014). Therefore, individuals with visual disabilities may particularly benefit from the opportunities that dog ownership may bring in terms of forging (and maintaining) relations and in terms of experiencing support from the constant non-judgemental presence of the dog. Given that it is how people experience their visual impairment rather than the clinical assessment of their vision which determines perceptions of social support (Hodge & Eccles, 2014), it would seem reasonable to propose that acquiring a trained guide improves owners general experiences of living with a disability, which is associated with increased feelings of positivity surrounding inter-personal relations.

By using a longitudinal cohort design, this study provides a valuable advance on the existing literature, but the results must be considered in light of certain practical limitations. The recruitment rate was low, being between 21% and 31% for the groups involved, and thus there may have been a significant sampling bias, exacerbated by many of the initial potential pool of clients on the Guide Dog UK database opting out of contact for research. We did not record how long individuals who acquired a dog between T1 and T2 had been with their dog for. Therefore, some

individuals may have very recently received a dog and others had their dog substantially longer. In order to assess in more detail, the potential cumulative effects of acquiring a guide dog, a larger sample size is necessary to enable reliable comparisons over time. Additionally, although use of the Flanagan Quality of Life Scale enabled comparisons with similar existing research, it does not enable us to propose mechanistic hypotheses, which are needed to further advance understanding in this field. Furthermore, we did not explore the potential impact of individual differences in demographics, such as relationship status, access to support groups and care facilities or length of time living with the disability, due to the relatively small sample size.

In conclusion, acquiring a guide dog can bring benefits to owner's perceived quality of life, particularly in terms of increasing perceptions of independence, when compared to those who remained on a waiting list to receive a trained dog. Effect size comparisons between guide dog and potential guide dog owners, revealed that those in the established guide dog group and those who recently acquired a guide dog demonstrated increased perceived QOL over time, but those who remained on the waiting list showed a decrease in QOL. This was most evident in items relating to health, material comforts, independence as well as total QOL. Although based on the results of this study alone, it is not possible to isolate the effects of owning a guide dog from other factors which may determine QOL. Comparisons of effect sizes with previous research looking at QOL with hearing dog and physical assistance dog partners showed that guide dog owners may specifically benefit from acquiring a trained dog in terms of improved perceptions of material comforts and inter-personal relationships.

Acknowledgements

We would like to thank the staff and service users at Guide Dogs, UK for their help and support in this project. We would specifically like to thank Becky Hunt, Research Associate for her help in sourcing participants.

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Table 1. Age category and gender status across the three experimental groups

	Received guide dog T1-T2 (n = 15)	Did not receive a guide dog T1-T2 (n = 17)	Established guide dog owner (n = 14)
Age category			
18-24 years	0% (0)*	5.9% (1)	0% (0)
25-34 years	6.7% (1)	5.9% (1)	0% (0)
35-44 years	13.3% (2)	17.6% (3)	14.3% (2)
45-54 years	40% (6)	29.4% (5)	28.6% (4)
55 years plus	40% (6)	41.2% (7)	57.1% (8)
Gender			
Male	40% (6)	41.2% (7)	57.1% (8)
Female	60% (9)	58.5% (10)	42.9% (6)

*Percent data, with count data in parentheses

Table 2. Descriptive data (mean \pm one standard error mean) and effect size comparisons (partial eta squared) for quality of life (QOL) scores.

	Time 1			Time 2			Effect Sizes for Change Scores (η_p^2)*			
	Received a guide dog (n = 15)	Guide dog waiting list (n = 17)	Established guide dog owner (n = 14)	Received a guide dog (n = 15)	Guide dog waiting list (n = 17)	Established guide dog owner (n = 14)	Effect size of group on change scores	Effect size of waiting list vs. established	Effect size received dog vs. waiting list	Effect size of received dog vs. established
Total QOL	74.33 \pm 2.63	77.35 \pm 3.34	87.64 \pm 3.46	78.93 \pm 2.89	76.17 \pm 2.89	88.42 \pm 2.84	0.07	0.01	0.10	0.04
Material comforts	5.13 \pm 0.19	5.00 \pm 0.25	5.71 \pm 0.39	5.00 \pm 0.25	4.82 \pm 0.23	6.07 \pm 0.19	0.07	0.07	<0.01	0.06
Health	4.80 \pm 0.29	5.05 \pm 0.33	5.07 \pm 0.37	5.00 \pm 0.27	4.52 \pm 0.33	4.71 \pm 0.41	0.08	<0.01	0.10	0.07
Relationships	4.60 \pm 0.29	4.70 \pm 0.37	5.28 \pm 0.22	5.00 \pm 0.23	4.58 \pm 0.24	5.50 \pm 0.37	0.03	0.02	0.05	<0.01
Children	5.20 \pm 0.40	5.52 \pm 0.28	6.07 \pm 0.24	5.06 \pm 0.43	5.47 \pm 0.27	5.71 \pm 0.28	0.01	0.02	<0.01	<0.01
Spouse	4.73 \pm 0.50	4.88 \pm 0.44	6.07 \pm 0.22	4.60 \pm 0.34	5.00 \pm 0.36	6.07 \pm 0.26	0.01	0.01	0.01	<0.01
Friends	4.40 \pm 0.23	4.88 \pm 0.40	5.71 \pm 0.32	4.80 \pm 0.39	4.94 \pm 0.35	5.64 \pm 0.35	0.02	<0.01	0.01	0.04
Helping	5.46 \pm 0.40	5.41 \pm 0.28	5.78 \pm 0.21	5.53 \pm 0.23	4.88 \pm 0.30	5.85 \pm 0.23	0.05	0.09	0.04	<0.01
Organisations	4.60 \pm 0.36	4.47 \pm 0.38	5.00 \pm 0.29	4.66 \pm 0.37	4.35 \pm 0.35	5.35 \pm 0.26	0.01	0.03	<0.01	0.01
Learning	4.40 \pm 0.41	4.82 \pm 0.28	5.71 \pm 0.35	5.00 \pm 0.33	4.88 \pm 0.25	5.64 \pm 0.24	0.06	<0.01	0.05	0.09
Understanding self	5.00 \pm 0.35	5.00 \pm 0.24	5.71 \pm 0.30	5.40 \pm 0.25	4.88 \pm 0.25	5.42 \pm 0.30	0.04	0.01	0.03	0.06
Work	4.46 \pm 0.23	4.52 \pm 0.32	5.35 \pm 0.38	4.40 \pm 0.27	4.52 \pm 0.21	5.28 \pm 0.28	<0.01	<0.01	<0.01	<0.01
Express self	4.13 \pm 0.44	4.70 \pm 0.29	4.71 \pm 0.38	4.60 \pm 0.38	4.88 \pm 0.31	5.00 \pm 0.29	0.01	<0.01	0.03	<0.01
Socialising	4.33 \pm 0.30	4.00 \pm 0.33	5.21 \pm 0.33	4.73 \pm 0.35	4.05 \pm 0.35	5.35 \pm 0.30	0.01	<0.01	0.01	0.01
Reading	4.93 \pm 0.30	4.94 \pm 0.32	5.78 \pm 0.29	5.53 \pm 0.25	5.35 \pm 0.22	6.14 \pm 0.23	0.01	<0.01	<0.01	0.01
Active recreation	4.00 \pm 0.37	4.64 \pm 0.34	5.00 \pm 0.36	4.66 \pm 0.27	4.64 \pm 0.27	5.14 \pm 0.36	0.03	<0.01	0.04	0.03
Independence	4.06 \pm 0.31	4.76 \pm 0.31	5.42 \pm 0.35	4.93 \pm 0.31	4.35 \pm 0.36	5.50 \pm 0.27	0.10	0.03	0.14	0.10

*Small = 0.01, Medium = 0.09, Large = 0.25

1 Table 3. Descriptive data (means \pm standard error mean) and effect size comparisons (partial
2 eta squared) for quality of life scores in guide dog owners and waiting list controls as
3 compared to hearing dog owners and physical service dog owners and their waiting list
4 counterparts.

	Guide dog waiting list (n = 17)	Guide dog owner (n = 14)	Effect size waiting list vs establis hed at T2 (η_p^2)	Hearin g dog waitin g list ¹ (n = 30)	Hearing dog owner (n = 111)	Effe ct size (η_p^2)	Physica l assistan ce dog waiting list ¹ (n = 24)	Physica l assistan ce dog owner (n = 72)	Effe ct size (η_p^2)
Total QOL	76.17 \pm 2. 89	88.42 \pm 2. 84	0.24	75.5 \pm 3. 17	80.61 \pm 1. 61	0.02	64.27 \pm 2. 94	80.72 \pm 1. 68	0.20
Material comforts	4.82 \pm 0.2 3	6.07 \pm 0.1 9	0.45	5.36 \pm 0. 23	5.38 \pm 0.1 1	< 0.01	4.94 \pm 0.2 3	5.54 \pm 0.1 3	0.05
Health	4.52 \pm 0.3 3	4.71 \pm 0.4 1	<0.01	3.99 \pm 0. 30	4.74 \pm 0.1 5	0.03	2.40 \pm 0.3 3	3.57 \pm 0.1 9	0.09
Relationshi ps	4.58 \pm 0.2 4	5.50 \pm 0.3 7	0.13	5.33 \pm 0. 32	4.88 \pm 0.1 6	0.01	4.39 \pm 0.3 2	5.30 \pm 0.1 8	0.06
Children	5.47 \pm 0.2 7	5.71 \pm 0.2 8	0.01	5.52 \pm 0. 32	5.45 \pm 0.1 6	< 0.01	4.47 \pm 0.3 8	4.79 \pm 0.2 1	0.01
Spouse	5.00 \pm 0.3 6	6.07 \pm 0.2 6	0.15	5.67 \pm 0. 35	5.35 \pm 0.1 8	< 0.01	4.17 \pm 0.3 8	5.02 \pm 0.2 2	0.04
Friends	4.94 \pm 0.3 5	5.64 \pm 0.3 5	0.06	5.18 \pm 0. 27	5.56 \pm 0.1 3	0.01	4.96 \pm 0.2 8	5.45 \pm 0.1 6	0.02
Helping	4.88 \pm 0.3 0	5.85 \pm 0.2 3	0.17	5.35 \pm 0. 26	5.61 \pm 0.1 3	0.01	4.10 \pm 0.2 8	5.62 \pm 0.1 6	0.20
Organisati ons	4.35 \pm 0.3 5	5.35 \pm 0.2 6	0.14	3.80 \pm 0. 37	4.43 \pm 0.1 9	0.02	3.62 \pm 0.3 2	5.05 \pm 0.1 8	0.11
Learning	4.88 \pm 0.2 5	5.64 \pm 0.2 4	0.13	4.00 \pm 0. 34	4.78 \pm 0.1 7	0.03	3.51 \pm 0.3 2	4.46 \pm 0.1 8	0.10
Understan ding self	4.88 \pm 0.2 5	5.42 \pm 0.3 0	0.06	4.86 \pm 0. 29	5.48 \pm 0.1 5	0.03	4.24 \pm 0.2 9	5.44 \pm 0.1 6	0.12
Work	4.52 \pm 0.2 1	5.28 \pm 0.2 8	0.14	4.20 \pm 0. 34	4.96 \pm 0.1 7	0.03	3.93 \pm 0.3 0	4.75 \pm 0.1 7	0.05
Express self	4.88 \pm 0.3 1	5.00 \pm 0.2 9	<0.01	4.94 \pm 0. 33	4.76 \pm 0.1 7	< 0.01	4.07 \pm 0.3 2	5.17 \pm 0.1 8	0.11
Socialising	4.05 \pm 0.3 5	5.35 \pm 0.3 0	0.19	3.56 \pm 0. 36	3.88 \pm 0.1 8	< 0.01	3.66 \pm 0.3 3	5.09 \pm 0.1 9	0.13
Reading	5.35 \pm 0.2 2	6.14 \pm 0.2 3	0.17	4.97 \pm 0. 35	5.06 \pm 0.1 7	< 0.01	4.71 \pm 0.2 4	5.81 \pm 0.1 4	0.14
Active recreation	4.64 \pm 0.2 7	5.14 \pm 0.3 6	0.04	3.75 \pm 0. 36	4.51 \pm 0.1 8	0.03	3.42 \pm 0.3 5	4.40 \pm 0.2 0	0.10
Independe nce	4.35 \pm 0.3 6	5.50 \pm 0.2 7	0.17	4.92 \pm 0. 30	5.72 \pm 0.1 5	0.04	3.59 \pm 0.2 9	5.15 \pm 0.1 6	0.20

*Small = 0.01, Medium = 0.09, Large = 0.25; ¹ Data obtained from Hall, MacMichael, Turner & Mills (2017)